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EXAMINER	
ROE, JESSEE RANDALL	

ART UNIT	PAPER NUMBER
1793	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/519,981	FUJITA ET AL.	
	Examiner	Art Unit	
	Jessee Roe	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 May 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 6-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 6-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 20 May 2008 has been entered.

Status of the Claims

Claims 1-4 and 6-18 are pending wherein claims 1-4 and 6-18 are amended and claims 5 and 19-21 are canceled.

Status of Previous Rejections

The previous rejection of claims 1-4 and 7-10 under 35 U.S.C. 103(a) as being unpatentable over Kawabata et al. (JP 09-013142) in view of Iwamoto et al. (JP 07-188847) is withdrawn in view of the Applicant's arguments and amendments to the claims. The previous rejection of claims 11-21 under 35 U.S.C. 103(a) as being unpatentable over Kawabata et al. (JP 09-013142) in view of Iwamoto et al. (JP 07-188847), and further in view of Lee (US 2,014,440) is withdrawn in view of the Applicant's arguments and amendments to the claims.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-4 and 6-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In regards to claim 1, a broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 1 recites the broad recitation “a metal structure of a steel”, and the claim also recites “a piston ring having a self-lubricating sliding property, which consists of a steel” which is the narrower statement of the range/limitation. Furthermore, it is

unclear whether "a steel" as recited in line 2 of claim 1 would be the same as the "a steel" recitation found in line 8 of claim 1.

Claims 11-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to the recitation "wherein sulfide inclusions observed in the section of the metal structure" of lines 8-9 of claim 11, the Examiner notes that in the compositional requirements of lines 2-6, sulfur is not included in the composition. Therefore, it the source of sulfide in the piston ring is unclear.

Examiner Interpretation

The Examiner has interpreted the recitation "wherein there can be" as recited in line 7 of claim 1 and lines 6-7 of claim 11 as optional language. MPEP 2111.04.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3-4 and 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. (US 5,562,786) in view of Koehler (US

3,561,087),

In regards to claim 1, Hayashi et al. ('786) discloses a ring-shaped, sintered steel material that would have application such as use in automotive parts comprising a composition relative to that of the instant invention as shown in the table below (col. 1, lines 22-27, col. 3, line 50 – col. 4, line 5 and Example I).

Element	From Instant Claims (weight percent)	Hayashi et al. ('786) (weight percent)	Overlap (weight percent)
C	0.4 – less than 1.3	0.2 – 1.6	0.4 – less than 1.3
Si	0.1 – 3.0	0 – 1	0.1 – 1.0
Mn	0.1 – 3.0	0 – 4	0.1 – 3.0
Cr	0 – 0.50	0 – 6	0 – 0.50
Ni	0.05 – 3.0	0 – 6	0.05 – 3.0
Al	0.7 – 2.0	0 – 2	0.7 – 2.0
Mo+W+V	0.3 – 20	0 – 11	0.3 – 11
Cu	0.05 – 3.0	0 – 4	0.05 – 3.0
Fe	remainder	remainder	remainder

The Examiner notes that the composition disclosed by Hayashi et al. ('786) overlaps the composition of the instant invention, which is prima facie evidence of obviousness. MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the claimed amounts of carbon, silicon, manganese, chromium, nickel, aluminum, molybdenum, tungsten, and vanadium from the amounts disclosed by Hayashi et al. ('786) because Hayashi et al. ('786) discloses the same utility throughout the disclosed ranges.

Hayashi et al. ('786) discloses a ring-shaped, sintered steel material having a composition as shown above, but Hayashi et al. ('786) does not distinctly specify forming the steel composition into a piston ring.

Koehler ('087) discloses that piston rings formed by powder metallurgical methods such as sintering allows for the piston ring to bear tightly against the cylinder during operation and operate under higher tangential stress (col. 1, lines 40-57 and col. 2, lines 37-48).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the ring-shaped sintered steel material, as disclosed by Hayashi et al. ('786), as the piston ring, as disclosed by Koehler ('087), in order to allow for a piston ring to bear tightly against the cylinder and operate under higher tangential stress, as disclosed by Koehler ('087) (col. 1, lines 40-57 and col. 2, lines 37-48).

In regards to claim 3, Hayashi et al. ('786) does not necessitate the addition of vanadium to the steel alloy because "Si, V, and Al each in an amount up to 1 wt %" would include 0 wt% (col. 4, lines 1-5).

In regards to claim 4, Hayashi et al. ('786) discloses up to 8 weight percent molybdenum and up to 2 weight percent tungsten (col. 3, line 64 – col. 4, line 5), which overlaps the range of 0.3 to 0.5 weight percent molybdenum and tungsten as instantly claimed. Hayashi et al. ('786) does not necessitate the addition of vanadium to the steel alloy because "Si, V, and Al each in an amount up to 1 wt %" would include 0 wt% (col. 4, lines 1-5).

In regards to claim 6, Hayashi et al. ('786) discloses up to 8 weight percent molybdenum (col. 3, line 64 - col. 4, line 5), which reads on the range of 1.5 to 3.0 weight percent molybdenum.

In regards to claim 7, Hayashi et al. ('786) discloses up to 2 weight percent cobalt (col. 4, lines 1-5).

In regards to claims 8-9, Hayashi et al. ('786) does not necessitate the addition of sulfur or calcium. Hayashi et al. ('786) therefore meets the claim limitations of "not more than 0.3% S" and "not more than 0.01% Ca" because "not more than" would include 0%.

In regards to claim 10, Hayashi et al. ('786) discloses subjecting the steel to a nitrogen gas atmosphere at elevated temperature (nitriding) (Examples 1-2).

Claims 1-4 and 6-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. (US 5,562,786) in view of Koehler (US 3,561,087), and further in view of Schladitz (US 3,343,953).

In regards to claim 1, Hayashi et al. ('786) discloses a ring-shaped, sintered steel material that would have application such as use in automotive parts comprising a composition relative to that of the instant invention as shown in the table below (col. 1, lines 22-27, col. 3, line 50 – col. 4, line 5 and Example I).

Element	From Instant Claims (weight percent)	Hayashi et al. ('786) (weight percent)	Overlap (weight percent)
C	0.4 – less than 1.3	0.2 – 1.6	0.4 – less than 1.3
Si	0.1 – 3.0	0 – 1	0.1 – 1.0
Mn	0.1 – 3.0	0 – 4	0.1 – 3.0
Cr	0 – 0.50	0 – 6	0 – 0.50
Ni	0.05 – 3.0	0 – 6	0.05 – 3.0
Al	0.7 – 2.0	0 – 2	0.7 – 2.0
Mo+W+V	0.3 – 20	0 – 11	0.3 – 11
Cu	0.05 – 3.0	0 – 4	0.05 – 3.0
Fe	remainder	remainder	remainder

The Examiner notes that the composition disclosed by Hayashi et al. ('786) overlaps the composition of the instant invention, which is prima facie evidence of obviousness. MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the claimed amounts of carbon, silicon, manganese, chromium, nickel, aluminum, molybdenum, tungsten, vanadium and copper from the amounts disclosed by Hayashi et al. ('786) because Hayashi et al. ('786) discloses the same utility throughout the disclosed ranges.

Hayashi et al. ('786) discloses a ring-shaped, sintered steel material having a composition as shown above, but Hayashi et al. ('786) does not distinctly specify forming the steel composition into a piston ring.

Koehler ('087) discloses that piston rings formed by powder metallurgical methods such as sintering allows for the piston ring to bear tightly against the cylinder during operation and operate under higher tangential stress (col. 1, lines 40-57 and col. 2, lines 37-48).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the ring-shaped sintered steel material, as disclosed by Hayashi et al. ('786), as the piston ring, as disclosed by Koehler ('087), in order to allow for a piston ring to bear tightly against the cylinder and operate under higher tangential stress, as disclosed by Koehler ('087) (col. 1, lines 40-57 and col. 2, lines 37-48).

Hayashi et al. ('786) in view of Koehler ('087) discloses a piston ring made

of sintered steel material and using graphite powder (Examples 1-2 of Hayashi et al. ('786) and Example of Koehler ('087)), but neither Hayashi et al. ('786) nor Koehler ('087) specify the size of the graphite powder.

Schladitz ('953) discloses inserting metal encapsulated graphite and/or metal encapsulated sulfide into metal interconnections wherein the metal encapsulated graphite and/or metal encapsulated sulfide would have a thickness of a few microns to about 1 micron in order to lower material wear and prevent premature deformation (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add metal encapsulated graphite and/or metal encapsulated sulfide, as disclosed by Schladitz ('953) into the piston ring made of sintered steel material, as disclosed by Hayashi et al. ('786) in view of Koehler ('087), in order to lower material wear and prevent premature deformation, as disclosed by Schladitz ('953) (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

In regards to claim 2, Schladitz ('953) discloses that once the lubricant (graphite, metal sulfide) is expended, sliding properties would deteriorate (col. 1, lines 35-61). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to maximize the amount of lubricant in order to prevent premature deterioration of sliding properties. MPEP 2144.05 II.

Still regarding claim 2, Schladitz ('953) discloses that the metal encapsulated graphite and/or metal encapsulated sulfide would have a thickness

of a few microns to about 1 micron (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

In regards to claim 3, Hayashi et al. ('786) does not necessitate the addition of vanadium to the steel alloy because "Si, V, and Al each in an amount up to 1 wt %" would include 0 wt% (col. 4, lines 1-5).

In regards to claim 4, Hayashi et al. ('786) discloses up to 8 weight percent molybdenum and up to 2 weight percent tungsten (col. 3, line 64 – col. 4, line 5), which overlaps the range of 0.3 to 0.5 weight percent molybdenum and tungsten as instantly claimed. Hayashi et al. ('786) does not necessitate the addition of vanadium to the steel alloy because "Si, V, and Al each in an amount up to 1 wt %" would include 0 wt% (col. 4, lines 1-5).

In regards to claim 6, Hayashi et al. ('786) discloses up to 8 weight percent molybdenum (col. 3, line 64 - col. 4, line 5), which reads on the range of 1.5 to 3.0 weight percent molybdenum.

In regards to claim 7, Hayashi et al. ('786) discloses up to 2 weight percent cobalt (col. 4, lines 1-5), which reads on the range of not more than 10 % of Co.

In regards to claims 8-9, Hayashi et al. ('786) does not necessitate the addition of sulfur or calcium. Hayashi et al. ('786) therefore meets the claim limitations of "not more than 0.3% S" and "not more than 0.01% Ca" because "not more than" would include 0%.

In regards to claim 10, Hayashi et al. ('786) discloses subjecting the steel

to a nitrogen gas atmosphere at elevated temperature (nitriding) (Examples 1-2).

In regards to claim 11, Hayashi et al. ('786) discloses a ring-shaped, sintered steel material that would have application such as use in automotive parts comprising a composition relative to that of the instant invention as shown in the table below (col. 1, lines 22-27, col. 3, line 50 – col. 4, line 5 and Example I).

Element	From Instant Claims (weight percent)	Hayashi et al. ('786) (weight percent)	Overlap (weight percent)
C	0.4 – less than 1.3	0.2 – 1.6	0.4 – less than 1.3
Si	0.1 – 3.0	0 – 1	0.1 – 1.0
Mn	0.1 – 3.0	0 – 4	0.1 – 3.0
Cr	0 – 0.50	0 – 6	0 – 0.50
Ni	0.05 – 3.0	0 – 6	0.05 – 3.0
Al	0.7 – 2.0	0 – 2	0.7 – 2.0
Mo+W+V	0.3 – 20	0 – 11	0.3 – 11
Cu	0.05 – 3.0	0 – 4	0.05 – 3.0
Fe	remainder	remainder	remainder

The Examiner notes that the composition disclosed by Hayashi et al. ('786) overlaps the composition of the instant invention, which is prima facie evidence of obviousness. MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the claimed amounts of carbon, silicon, manganese, chromium, nickel, aluminum, molybdenum, tungsten, vanadium and copper from the amounts disclosed by Hayashi et al. ('786) because Hayashi et al. ('786) discloses the same utility throughout the disclosed ranges.

Hayashi et al. ('786) discloses a ring-shaped, sintered steel material having a composition as shown above, but Hayashi et al. ('786) does not distinctly specify forming the steel composition into a piston ring.

Koehler ('087) discloses that piston rings formed by powder metallurgical methods such as sintering allows for the piston ring to bear tightly against the cylinder during operation and operate under higher tangential stress (col. 1, lines 40-57 and col. 2, lines 37-48).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the ring-shaped sintered steel material, as disclosed by Hayashi et al. ('786), as the piston ring, as disclosed by Koehler ('087), in order to allow for a piston ring to bear tightly against the cylinder and operate under higher tangential stress, as disclosed by Koehler ('087) (col. 1, lines 40-57 and col. 2, lines 37-48).

Hayashi et al. ('786) in view of Koehler ('087) discloses a piston ring made of sintered steel material and using graphite powder (Examples 1-2 of Hayashi et al. ('786) and Example of Koehler ('087)), but neither Hayashi et al. ('786) nor Koehler ('087) specify the size of the graphite powder.

Schladitz ('953) discloses inserting metal encapsulated graphite and/or metal encapsulated sulfide into metal interconnections wherein the metal encapsulated graphite and/or metal encapsulated sulfide would have a thickness of a few microns to about 1 micron in order to lower material wear and prevent premature deformation (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add metal encapsulated graphite and/or

metal encapsulated sulfide, as disclosed by Schladitz ('953) into the piston ring made of sintered steel material, as disclosed by Hayashi et al. ('786) in view of Koehler ('087), in order to lower material wear and prevent premature deformation, as disclosed by Schladitz ('953) (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

Still regarding claim 11, Koehler ('087) discloses that with the addition of graphite, lead and other heavy metals (which would include molybdenum sulfide and/or tungsten sulfide considering Schladitz ('953)), the ring would have an unvaried cross-section along its periphery (col. 1, lines 32-39) which would read on "wherein sulfide inclusions observed in the section of the metal structure, being parallel to the periphery of the piston ring, are distributed such that straight lines each passing through a major axis of the respective sulfide inclusion cross one another within a cross angle of not more than 30 degrees which angles is referred to as a degree of parallelism".

In regards to claim 12, Schladitz ('953) discloses that once the lubricant (graphite, metal sulfide) is expended, sliding properties would deteriorate (col. 1, lines 35-61). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to maximize the amount of lubricant in order to prevent premature deterioration of sliding properties. MPEP 2144.05 II.

Still regarding claim 12, Schladitz ('953) discloses that the metal encapsulated graphite and/or metal encapsulated sulfide would have a thickness of a few microns to about 1 micron (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

In regards to claim 13, Hayashi et al. ('786) discloses up to 2 weight percent cobalt (col. 4, lines 1-5), which reads on the range of not more than 10 % of Co.

In regards to claims 14-15, Hayashi et al. ('786) does not necessitate the addition of sulfur or calcium. Hayashi et al. ('786) therefore meets the claim limitations of "not more than 0.3% S" and "not more than 0.01% Ca" because "not more than" would include 0%.

In regards to claim 16, Hayashi et al. ('786) discloses subjecting the steel to a nitrogen gas atmosphere at elevated temperature (nitriding) (Examples 1-2).

With respect to the recitations "wherein the steel has been forged, drawn and/or rolled from an ingot" of claim 17 and "wherein the wire material has been annealed and subjected to quenching and tempering" of claim 18, the Examiner notes that the claim is drawn to a product and not a process. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. MPEP 2113.

Claims 1-4 and 7-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kubota et al. (US 2002/0005616) in view of Schladitz (US 3,343,953).

In regards to claim 1, Kubota et al. ('616) discloses a piston ring comprising a composition relative to that of the instant invention as shown in the table below (abstract, [0048] and [0051]).

Element	From Instant Claims (weight percent)	Kubota et al. ('616) (weight percent)	Overlap (weight percent)
C	0.4 – less than 1.3	0.3 – less than 0.8	0.4 – less than 0.8
Si	0.1 – 3.0	0.1 – 3.0	0.1 – 3.0
Mn	0.1 – 3.0	0.1 – 3.0	0.1 – 3.0
Cr	0 – 0.50	0.3 – 1	0.3 – 0.5
Ni	0.05 – 3.0	0 – 2	0.05 – 2
Al	0.7 – 2.0	0 – 1.5	0.7 – 1.5
Mo+W+V	0.3 – 20	0 – 2.5	0.3 – 2.5
Cu	0.05 – 3.0	0 – 3.0	0.05 – 3.0
Fe	remainder	remainder	remainder

The Examiner notes that the composition disclosed by Kubota et al. ('616) overlaps the composition of the instant invention, which is prima facie evidence of obviousness. MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the claimed amounts of carbon, silicon, manganese, chromium, nickel, aluminum, molybdenum, tungsten, vanadium and copper from the amounts disclosed by Kubota et al. ('616) because Kubota et al. ('616) discloses the same utility throughout the disclosed ranges.

Kubota et al. ('616) discloses a piston ring having a composition as shown in the table above, but Kubota et al. ('616) does not specify "wherein there can be observed graphite particles having an average particle size of not more than 3 μm in a section of a metal structure of a steel.".

Schladitz ('953) discloses inserting metal encapsulated graphite and/or metal encapsulated sulfide into metal interconnections wherein the metal

encapsulated graphite and/or metal encapsulated sulfide would have a thickness of a few microns to about 1 micron in order to lower material wear and prevent premature deformation (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add metal encapsulated graphite and/or metal encapsulated sulfide, as disclosed by Schladitz ('953) into the piston ring, as disclosed by Kubota et al. ('616), in order to lower material wear and prevent premature deformation, as disclosed by Schladitz ('953) (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

In regards to claim 2, Schladitz ('953) discloses that once the lubricant (graphite, metal sulfide) is expended, sliding properties would deteriorate (col. 1, lines 35-61). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to maximize the amount of lubricant in order to prevent premature deterioration of sliding properties. MPEP 2144.05 II.

Still regarding claim 2, Schladitz ('953) discloses that the metal encapsulated graphite and/or metal encapsulated sulfide would have a thickness of a few microns to about 1 micron (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

In regards to claim 3, Kubota et al. ('616) does not necessitate the addition of vanadium to the steel alloy because "0.5 or less in total of one or more of V, Nb, Ti" would include 0 wt% (abstract).

In regards to claim 4, Kubota et al. ('616) discloses up to 2 weight percent of molybdenum and tungsten [0051], which overlaps the range of 0.3 to 0.5 weight percent molybdenum and tungsten as instantly claimed. Kubota et al. ('616) does not necessitate the addition of vanadium to the steel alloy because "0.5 or less in total of one or more of V, Nb, Ti" would include 0 wt% (abstract).

In regards to claim 7, Kubota et al. ('616) does not necessitate the addition of cobalt and "not more than 10 % of Co" as instantly claimed would include 0 %.

In regards to claim 8, Kubota et al. ('616) discloses 0.03 to 0.30 weight percent sulfur, which would within the range of "not more than 0.3% of S" [0043].

In regards to claim 9, Kubota et al. ('616) discloses 0.0001 to 0.01 weight percent calcium [0044], which would be within the range of "not more than 0.01 % of Ca".

In regards to claim 10, Kubota et al. ('616) discloses a nitriding treatment [0013].

In regards to claim 11, Kubota et al. ('616) discloses a piston ring comprising a composition relative to that of the instant invention as shown in the table below (abstract, [0048] and [0051]).

Element	From Instant Claims (weight percent)	Kubota et al. ('616) (weight percent)	Overlap (weight percent)
C	0.4 – less than 1.3	0.3 – less than 0.8	0.4 – less than 0.8
Si	0.1 – 3.0	0.1 – 3.0	0.1 – 3.0
Mn	0.1 – 3.0	0.1 – 3.0	0.1 – 3.0
Cr	0 – 0.50	0.3 – 1	0.3 – 0.5
Ni	0.05 – 3.0	0 – 2	0.05 – 2
Al	0.7 – 2.0	0 – 1.5	0.7 – 1.5
Mo+W+V	0.3 – 20	0 – 2.5	0.3 – 2.5
Cu	0.05 – 3.0	0 – 3.0	0.05 – 3.0
Fe	remainder	remainder	remainder

The Examiner notes that the composition disclosed by Kubota et al. ('616) overlaps the composition of the instant invention, which is prima facie evidence of obviousness. MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the claimed amounts of carbon, silicon, manganese, chromium, nickel, aluminum, molybdenum, tungsten, vanadium and copper from the amounts disclosed by Kubota et al. ('616) because Kubota et al. ('616) discloses the same utility throughout the disclosed ranges.

Kubota et al. ('616) discloses a piston ring having a composition as shown in the table above, but Kubota et al. ('616) does not specify "wherein there can be observed graphite particles having an average particle size of not more than 3 μm in a section of a metal structure of a steel.".

Schladitz ('953) discloses inserting metal encapsulated graphite and/or metal encapsulated sulfide into metal interconnections wherein the metal encapsulated graphite and/or metal encapsulated sulfide would have a thickness of a few microns to about 1 micron in order to lower material wear and prevent premature deformation (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add metal encapsulated graphite and/or metal encapsulated sulfide, as disclosed by Schladitz ('953) into the piston ring, as disclosed by Kubota et al. ('616), in order to lower material wear and prevent

premature deformation, as disclosed by Schladitz ('953) (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

Still regarding claim 11, Kubota et al. ('616) discloses that the sulfide inclusions would be distributed such that the intersecting angle between the maximum size of any one major sulfide inclusion and another major sulfide inclusion would be not more than 30° [0016].

In regards to claim 12, Schladitz ('953) discloses that once the lubricant (graphite, metal sulfide) is expended, sliding properties would deteriorate (col. 1, lines 35-61). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to maximize the amount of lubricant in order to prevent premature deterioration of sliding properties. MPEP 2144.05 II.

Still regarding claim 12, Schladitz ('953) discloses that the metal encapsulated graphite and/or metal encapsulated sulfide would have a thickness of a few microns to about 1 micron (col. 1, lines 8-12, col. 1, lines 35-62, col. 2, lines 41-71 and claim 1).

In regards to claim 13, Kubota et al. ('616) does not necessitate the addition of cobalt and "not more than 10 % of Co" as instantly claimed would include 0 %.

In regards to claim 14, Kubota et al. ('616) discloses 0.03 to 0.30 weight percent sulfur, which would within the range of "not more than 0.3% of S" [0043].

In regards to claim 15, Kubota et al. ('616) discloses 0.0001 to 0.01 weight percent calcium [0044], which would be within the range of "not more than 0.01 % of Ca".

In regards to claim 16, Kubota et al. ('616) discloses a nitriding treatment [0013].

With respect to the recitations "wherein the steel has been forged, drawn and/or rolled from an ingot" of claim 17 and "wherein the wire material has been annealed and subjected to quenching and tempering" of claim 18, although the Examiner notes that Kubota et al. ('616) discloses forging (Example 4) which reads on claim 17, the Examiner also notes that the claim is drawn to a product and not a process. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. MPEP 2113.

Response to Arguments

Applicant's arguments with respect to claims 1-4 and 6-18 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jessee Roe whose telephone number is (571) 272-5938. The examiner can normally be reached on Monday-Friday 7:30 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Roy V. King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John P. Sheehan/
Primary Examiner, Art Unit 1793

JR